RIPP: Holistic Player Evaluation with Region-Based Isolated Player Performance

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Motivation

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Use play-by-play data to evaluate individual player actions

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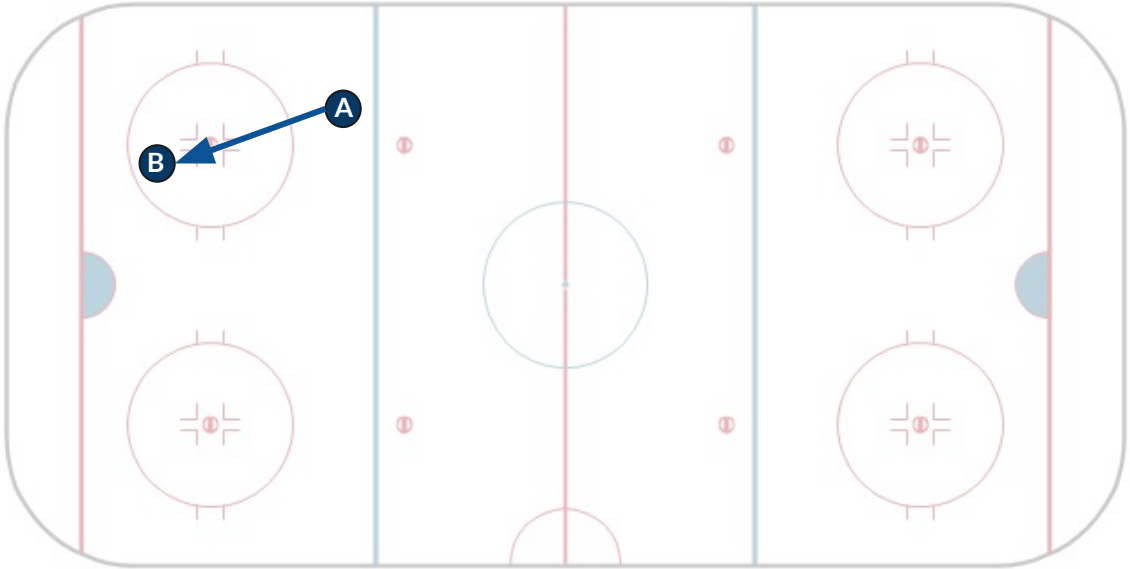
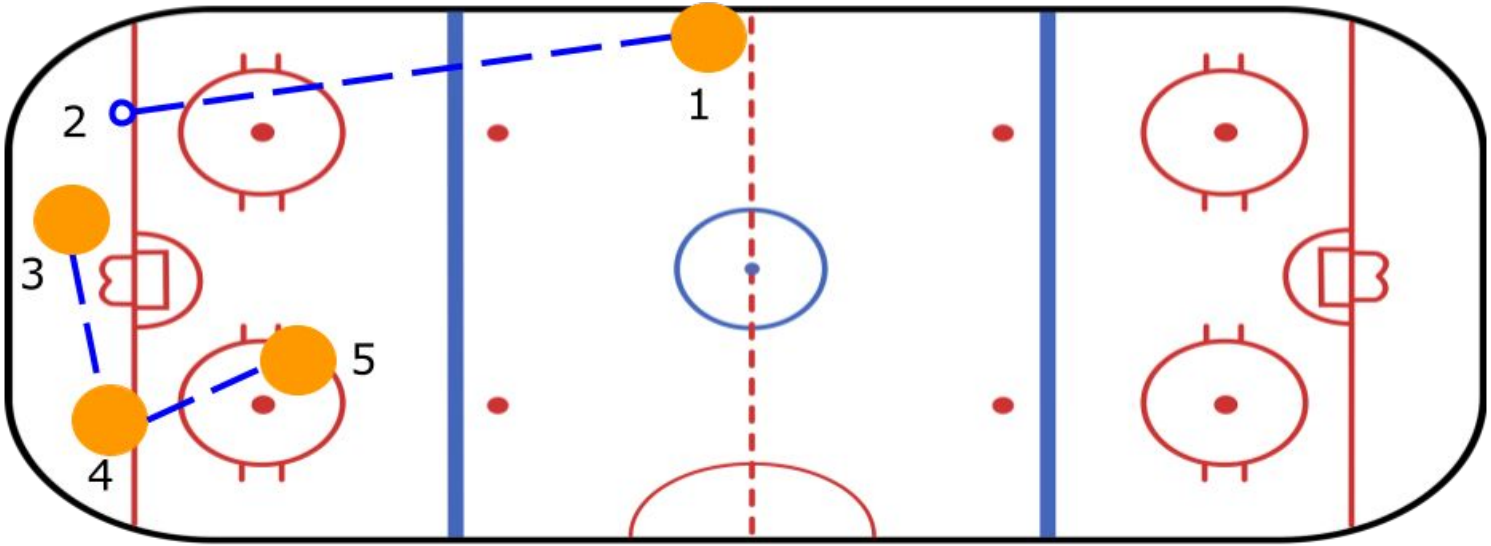
Develop a metric to isolate individual player performance

Framework

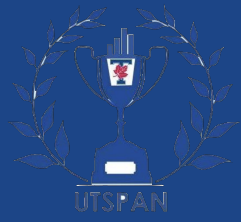
- Assign a value to every location on the ice: **Value(x,y) = P_{Goal}(x,y)**
- Calculate the value of a player's action: **RIPP = value(state B) - value(state A)**





Event	Start Value	End Value	RIPP (End - Start)
Dump In	0.26	0.64	0.38
Puck Recovery	0.64	0.59	-0.05
Play	0.59	0.63	0.04
Play	0.63	0.74	0.11
Goal	0.74	1.00	0.26

Proof of Concept

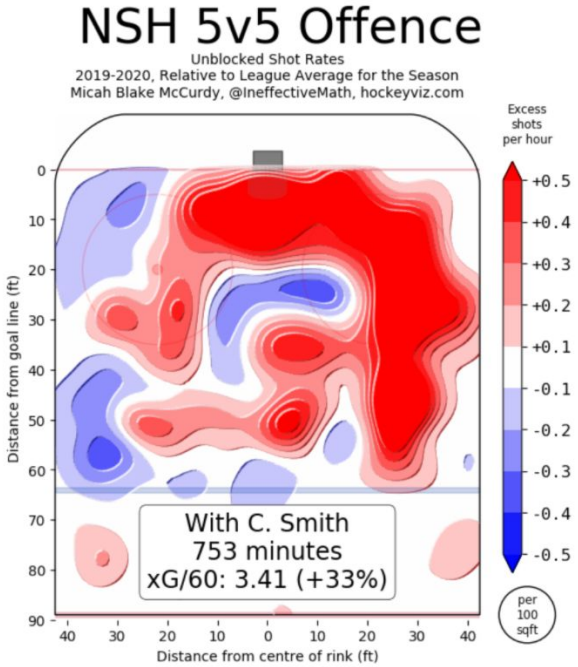


Set of states and their values

Start and end state for each action type

Introduction to xG

- Expected goals: probability of scoring
- Use contextual data like shot distance, shot angle, etc.
- Commonly implemented with logistic regression
- Example: Craig Smith's expected goal map



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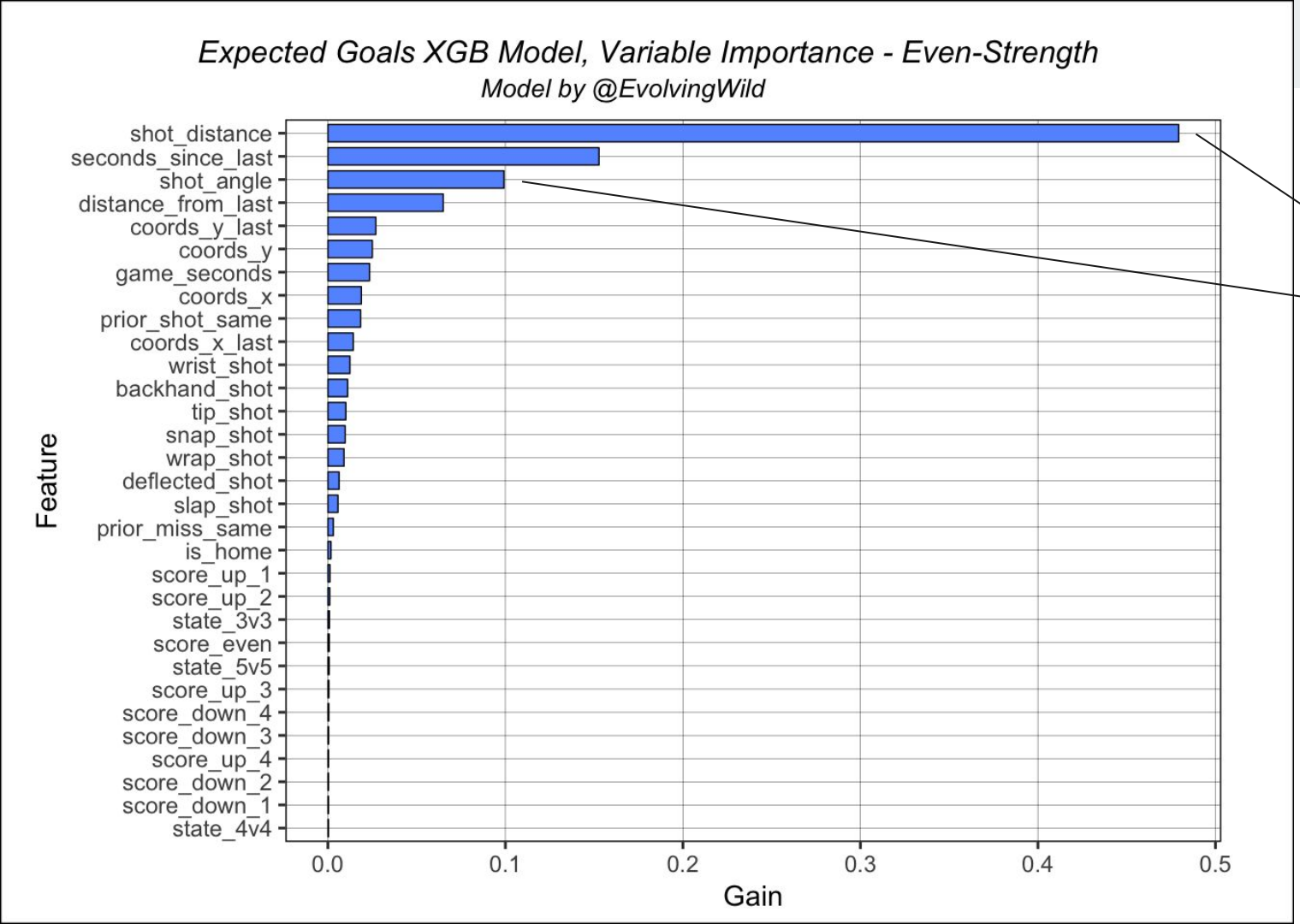

Note the relative Importance of shot angle and distance

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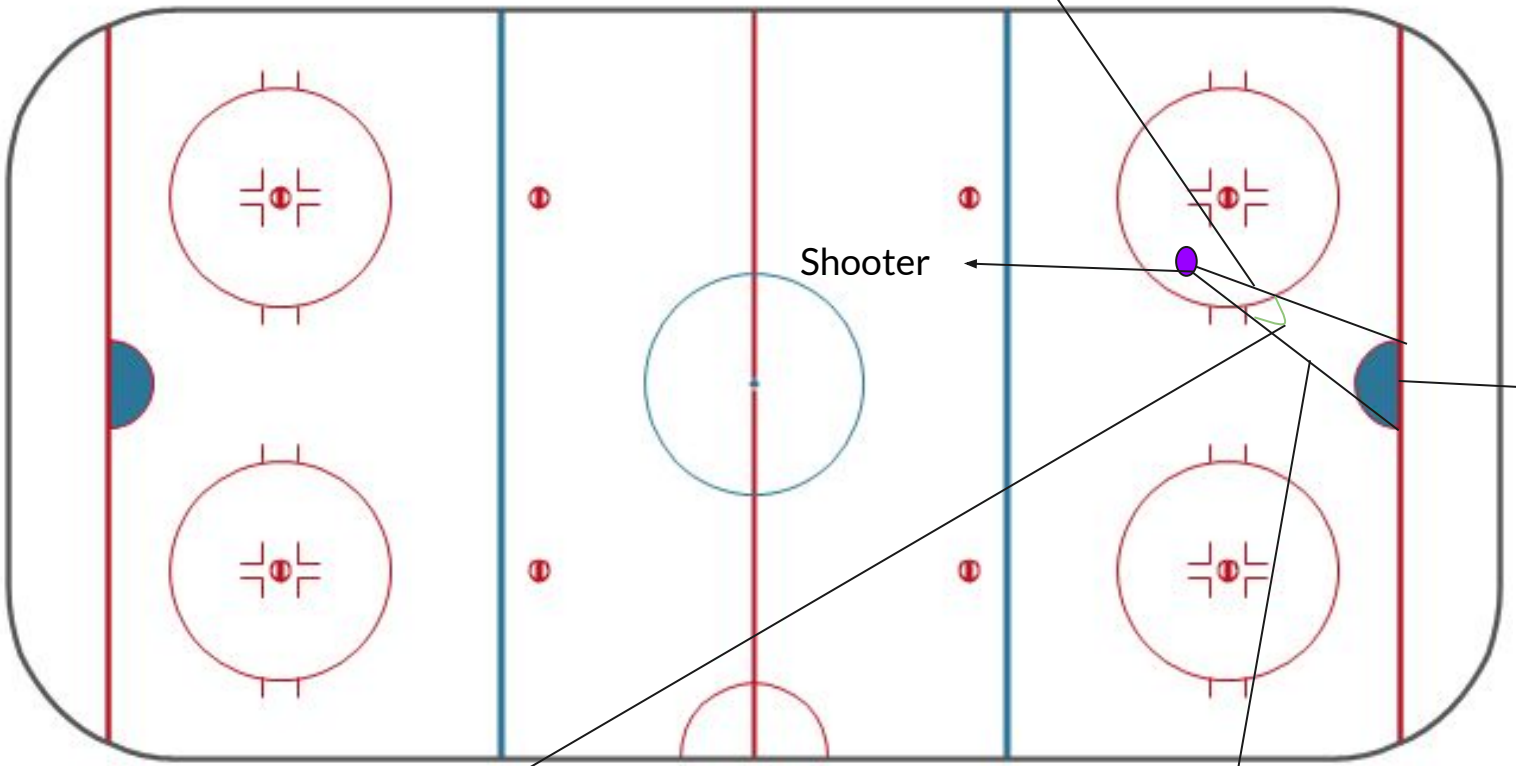
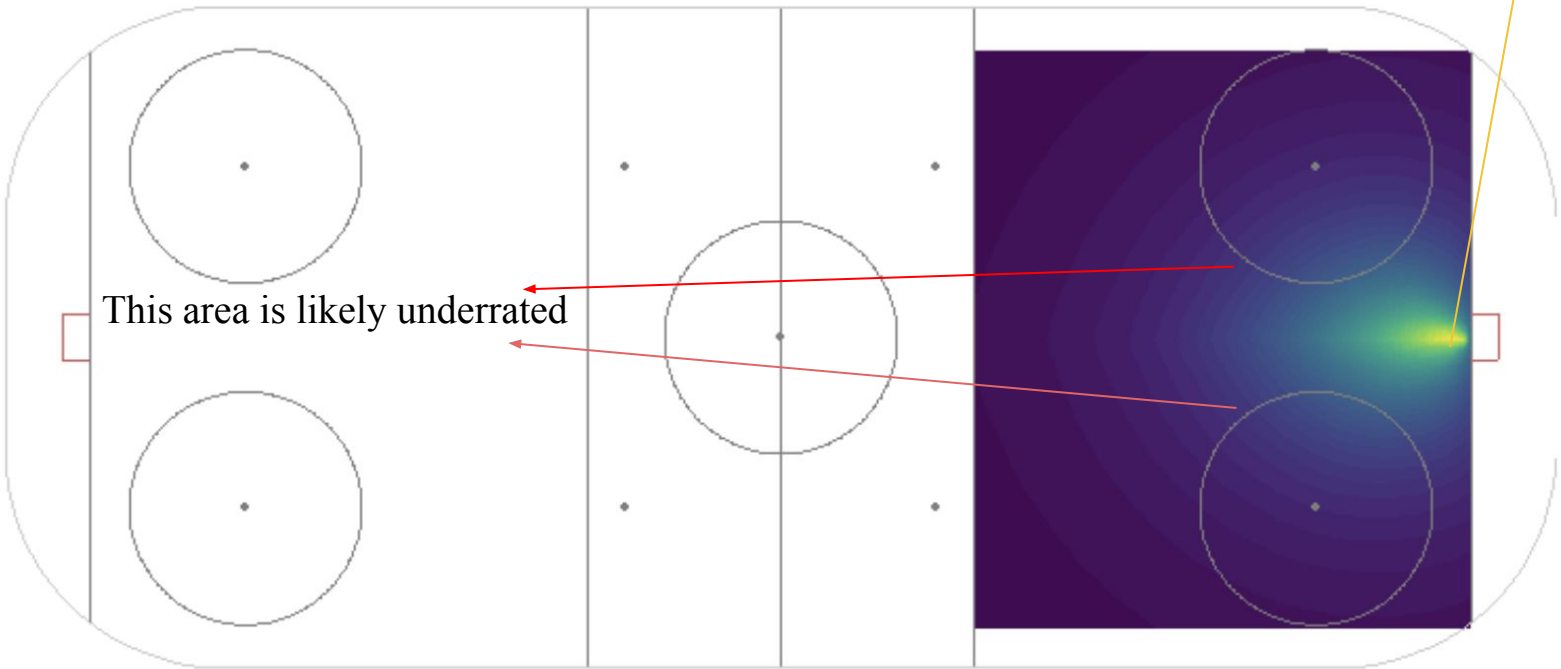
Methodology



Expected Goals Model



State Transitions

	Start Value	End Value
Play	Start loc. xG	xG at end loc. of pass
Incomplete Play	Start loc. xG	Opponent xG at end loc. of pass
Puck Recovery	-xG at previous event start loc.	xG at recovery loc.
Dump In/Out	Dump Start loc. xG	xG at recovery or -xG if not recovered
Faceoff Win	0.5*(Faceoff loc. xG)-0.5*(Opp. Faceoff loc. xG)	Next event loc. xG
Shot	xG at shot loc.	xG at next event loc.
Goal	1	xG at shot loc.

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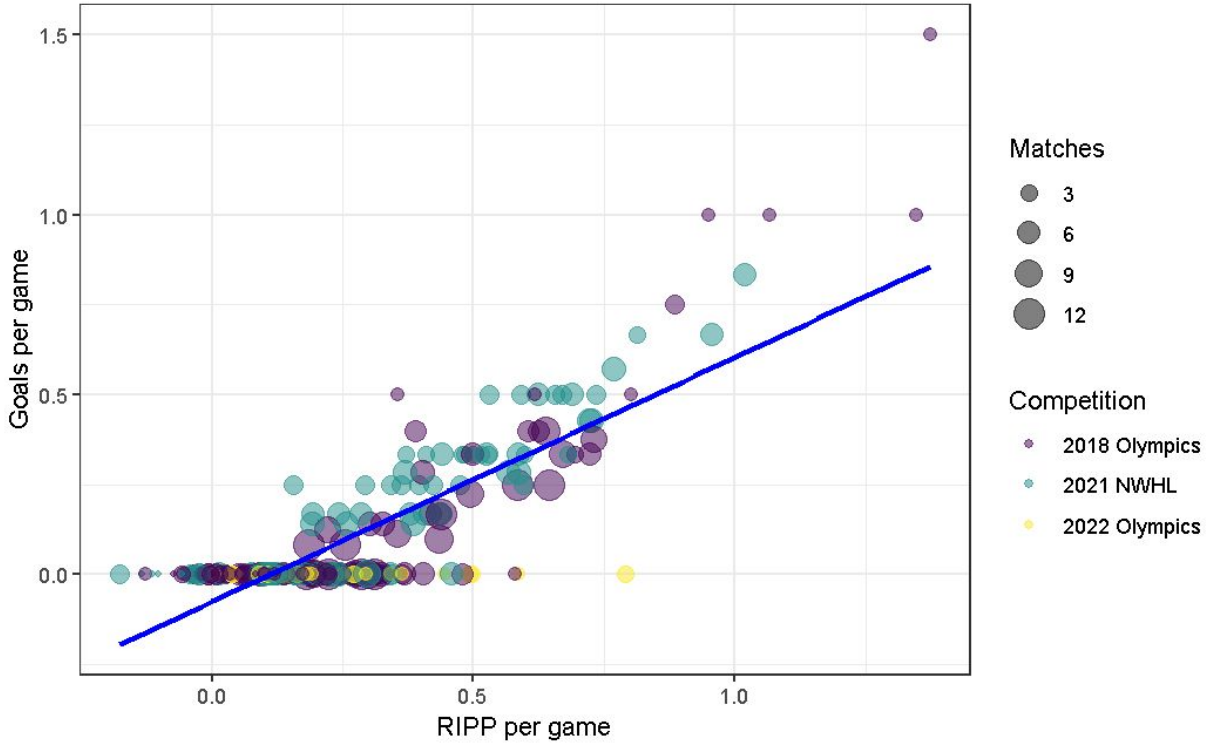
Results

Results - Players



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Results - Top 10 Players

Player <chr>	Team <chr>	Matches <int>	RIPP_per_game <dbl>
Mikyla Grant-Mentis	Toronto Six	6	1.02
Taylor Woods	Toronto Six	6	0.96
Samantha Davis	Boston Pride	7	0.77
Mallory Souliotis	Boston Pride	7	0.73
Melodie Daoust	Olympic (Women) - Canada	8	0.73
McKenna Brand	Boston Pride	7	0.72
Susanna Tapani	Olympic (Women) - Finland	6	0.72
Jillian Dempsey	Boston Pride	6	0.69
Hilary Knight	Olympic (Women) - United States	9	0.67
Marie-Philip Poulin	Olympic (Women) - Canada	10	0.64

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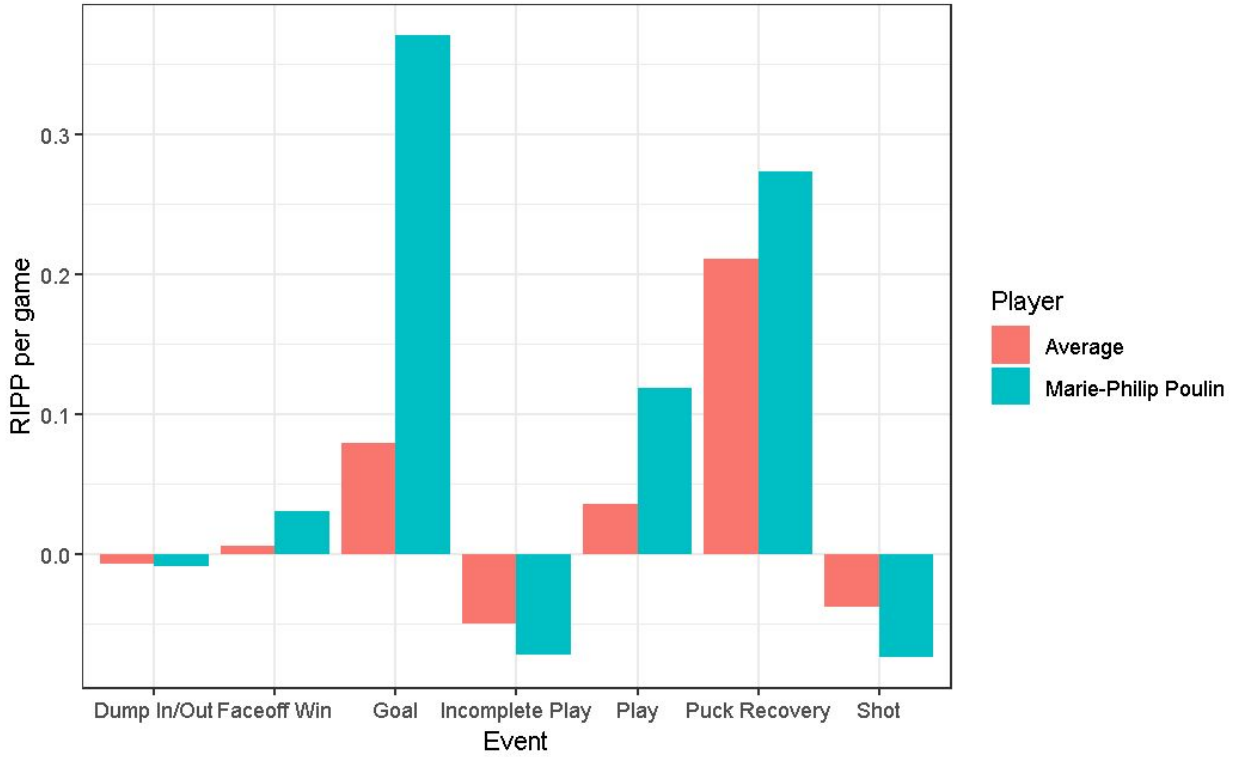
Results - Marie-Philip Poulin



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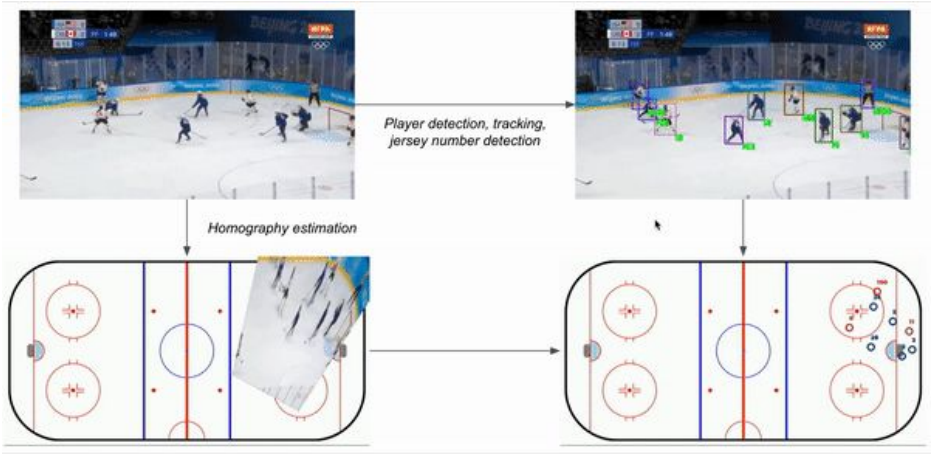
Limitations & Next Steps

- Off-puck actions, defense
  - Tracking data
- Expected goals as state value
  - Time interval (V-ICE)
- Drive analytics in women's hockey
  - Release code open-source as R package



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The Comprehensive R Archive Network

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Thanks!

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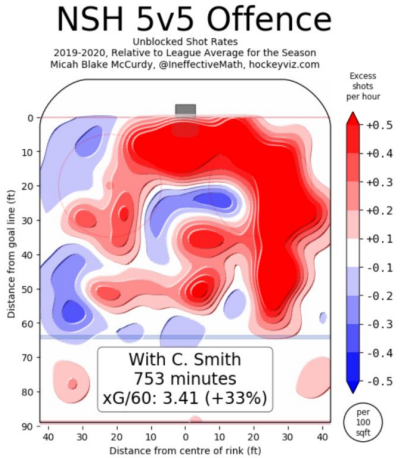
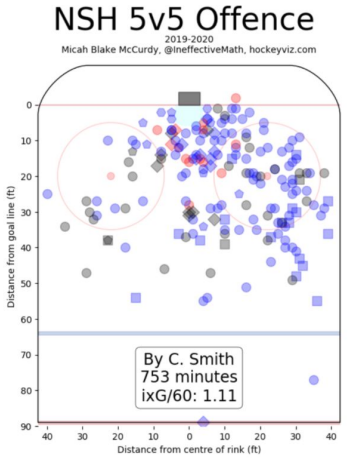
Introduction to xG

- In hockey, possession is estimated using a metric called expected goals
- Expected goals quantify the “value” or “danger” of a scoring chance
- Logistic regression models are fed contextual data like shot distance, shot angle, time of shot, goal differential, and other factors to estimate the value of a shot
- On the right, we can see Craig Smith’s expected goal map, which shows why he is valued by the analytics community





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